

WHAT IS CLAIMED IS:

1. A method of separating metal powder from a slurry of liquid metal and metal powder and salt, comprising introducing the slurry into a first vessel operated in an inert and/or vacuum environment for separation of liquid metal from the metal powder and salt leaving principally salt and metal powder substantially free of liquid metal, transferring the salt and metal powder substantially free of liquid metal to a second vessel operated in an inert environment, and thereafter treating the salt and metal powder to produce passivated metal powder substantially free of salt and liquid metal.
2. The method of claim 1, wherein the inert environment is an argon atmosphere.
3. The method of claim 1, wherein the salt and metal powder are crushed to form clumps having diameters less than about five centimeters prior to passivation.
4. The method of claim 1, wherein the liquid metal is separated from the salt and metal powder in the first vessel both as a liquid and as a vapor.
5. The method of claim 4, wherein the liquid metal vapor from the first vessel is transferred to a condenser operated in an inert environment.
6. The method of claim 4, wherein the liquid metal is an alkali or an alkaline earth metal or mixtures thereof.
7. The method of claim 6, wherein the salt is a halide.
8. The method of claim 7, wherein the metal powder is titanium or a titanium alloy.
9. The method of claim 8, wherein the titanium or titanium alloy is CP 1 to CP 4.
10. The method of claim 9, wherein the metal powder has diameters in the range of from about 0.1 to about 10 microns.
11. The method of claim 1, wherein passivation occurs on a conveyor.
12. The method of claim 11, wherein the metal powder is continuously cooled and passivated.

13. The method of claim 1, wherein the environments of the first and second vessels are protected from contamination by oxygen during the production of metal powder substantially free of salt and liquid metal.

14. A method of separating metal powder from a slurry of liquid metal and metal powder and salt formed by introducing a metal halide vapor subsurface of a liquid metal causing an exothermic reaction producing salt and metal powder with the liquid metal being present in excess of the stoichiometric amount required, comprising introducing the slurry into a first vessel operated in an inert and/or vacuum environment for filtration and vaporization of liquid metal from the metal powder and salt leaving principally salt and metal powder substantially free of liquid metal, transferring the liquid metal vapor to a condenser operated in an inert environment to convert the liquid metal vapor to a liquid to be recycled for production of additional metal powder, transferring the salt and metal powder substantially free of liquid metal to a second vessel operated in an inert environment, and thereafter treating the salt and metal powder to produce passivated metal powder substantially free of salt and liquid metal.

15. The method of claim 14, wherein the slurry is heated in the first vessel by contact with a heat exchanger internal to the first vessel having heat exchange fluid pumped therethrough.

16. The method of claim 14, wherein the liquid metal vapor from the first vessel is cooled by contact with heat exchanger internal to the condenser having a heat exchange fluid pumped therethrough.

17. The method of claim 14, wherein the first vessel is heated by both an internal and an external heat exchanger.

18. The method of claim 14, wherein the slurry is introduced into the interior of a candle filter in the first vessel with liquid metal flowing through the candle filter and out of the first vessel.

19. The method of claim 14, wherein the inert environment for the first and second vessels is an argon atmosphere.

20. The method of claim 19, wherein the condenser is operated in an argon atmosphere.

21. The method of claim 14, wherein the environments of the first and second vessels are protected from contamination by oxygen during the production of metal powder substantially free of salt and liquid metal.

22. A system for separating metal powder from a slurry of liquid metal and metal powder and salt formed by introducing a metal halide vapor subsurface of a liquid metal causing an exothermic reaction producing salt and metal powder with the liquid metal being present in excess of the stoichiometric amount required, comprising a first inerted vessel in communication with a heater and a filter for filtering liquid metal from the slurry and for heating liquid metal to vaporize the liquid metal from the salt and metal powder forming a filter cake of salt and metal powder, an inerted condenser in communication with said first vessel for receiving metal vapor and converting same to liquid metal, a second inerted vessel in valved communication with said first inerted vessel for receiving filter cake therefrom; a crusher in or in communication with said second inerted vessel for crushing the filter cake; a cooling and passivating station for receiving crushed filter cake, and a valve mechanism intermediate said first and second vessel and between said second vessel and said cooling and passivating station to prevent air from contaminating said first and second vessels during transfer of filter cake from said first vessel to said cooling and passivating station.

23. The system of claim 22, wherein said heater in communication with said first inerted vessel is interior of said vessel.

24. The system of claim 23, wherein said heater interior of said inerted first vessel is in communication with a source of heat exchange fluid which optionally is dedicated to said heater.

25. The system of claim 22, wherein said filter in communication with said first inerted vessel is interior of said vessel.

26. The system of claim 25, wherein said filter is a filter forming an annulus with said first inerted vessel into which liquid metal flows, and further including a conduit

in communication with said annulus for transferring liquid metal from said first inerted vessel to an inerted liquid metal reservoir.

27. The system of claim 22, wherein said first and second inerted vessels are inerted with argon.

28. The system of claim 27, wherein said condenser is inerted with argon.

29. The system of claim 28, wherein said inerted condenser is in communication with an argon inerted reservoir for liquid metal formed from condensed metal vapor.

30. The system of claim 22, wherein said condenser is in communication with a source of heat exchange fluid which optionally is dedicated to said condenser.

31. The system of claim 22, wherein said valve intermediate said first and second inerted vessel is hinged to open into said second inerted vessel.

32. The system of claim 22, wherein said first and second vessel are integral.